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Memoir

OF

William Copley, F.R.S.

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M E M O I R

OF

William Coplen, F.R.S.



[Reprinted from the GEOLOGICAL MAGAZINE, Decade IV. Vol. I.
December, 1894.]

HERTFORD :
STEPHEN AUSTIN AND SONS.

—
1894

Memoir of William Topley, F.R.S.

The copies of this Memoir, and the accompanying Portrait, are presented by the under-mentioned Colleagues of the late WILLIAM TOPLEY, as a slight token of their regard for him and of their sympathy with Mrs. Topley.

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William Topley, F.R.S.

WILLIAM TOPLEY was born at Greenwich, on March 13th, 1841 ; and after gaining his early education at local schools, he received, during the years 1858-61, the valuable scientific and practical training of the Royal School of Mines.

In 1862 he was appointed an Assistant Geologist on the Geological Survey, when Murchison was Director-General, and Ramsay was Local Director for Great Britain. He then commenced field-work under the guidance of Dr. (now Professor) Le Neve Foster, who, with others, was engaged in the Survey of the Wealden area. There he was initiated into the methods of geological mapping among the changeful Hastings Beds, at Mayfield and other places between Burwash and Lindfield, to the south of Ashdown Forest. There, too, in course of time, he gained a detailed knowledge of the Cretaceous and Neocomian formations, and his interest was aroused in questions of Physical Geology, to which for many years he gave particular attention.

In conjunction with his colleague Dr. Foster he made a study of the superficial deposits over a large part of the Wealden area, and more especially of the gravels of the Medway valley ; and together they elaborated in 1865 the well-known paper in which they brought their knowledge to bear on the vexed subject of the Denudation of the Weald. In this essay they gave numerous facts and new arguments to prove, what had in general terms been

taught by Ramsay, that the main features of the ground were sculptured by the agency of rain and rivers.

On the completion of the Geological Survey of the Wealden area, the preparation of the descriptive Memoir devolved upon Mr. Topley. Other colleagues, Mr. F. Drew, Mr. C. Gould, and Dr. Foster, who had mapped large portions of the region, had resigned their official positions; but Mr. Topley had had numerous opportunities of becoming generally acquainted with the entire district. How carefully his Memoir was written, and how exhaustively (so far as our knowledge then existed), is known to every geologist. The book, which was published in 1875, at once became the standard work of reference; for, apart from its original information, it gave evidence, as did all his writings, of a thorough study of the publications of other observers, and a full acknowledgment of all they had done.

Meanwhile Mr. Topley had been instructed to proceed to the Coal-field of Northumberland and Durham, and much of his literary labour connected with the Memoir had to be performed in that northern region in the winter time, or at other seasons when field-work was impracticable. In 1868, after six years' service, he had been advanced to the rank of Geologist on the Geological Survey — promotion in those earlier days being far more rapid than at the present time.

When, in 1872, the Committee of the Sub-Wealden Exploration commenced their active operations near Battle, Mr. Topley was, of course, specially interested. He was one of the first to be consulted, and, later on, he was expressly sent by the Geological Survey to the locality, to examine and report upon the cores brought up by the boring-apparatus. He was thereby enabled to record, in his Memoir on the Geology of the Weald, particulars of the strata and their fossils to a depth of over 1000 feet. The classification of the strata given in that work was subsequently modified, and Mr. Topley from time to time contributed many reports and other articles on the subject (see Appendix).

A considerable portion of Mr. Topley's sojourn in the north was spent at Rothbury, near Morpeth, and at Alnwick, where his studies were directed mainly to the Carboniferous rocks and to

the Glacial Drifts. The nature of that great sheet of basalt known as the Whin Sill, also engaged his attention and that of his friend and former colleague, Prof. Lebour, and the result of their observations was to prove its intrusive character.

The subject of Denudation never ceased to interest Mr. Topley, and when, during the early years of the *GEOLoGICAL MAGAZINE*, many warm discussions took place concerning the origin of escarpments and other features, he joined in the fray on behalf of sub-aërial agents. In confirmation of views that had been expressed with regard to other regions, he pointed out how in East Yorkshire anticlines, by their fissured summits, had been readily acted upon by inland agents of erosion, whereas, in certain cases, synclines had better withstood the assaults of rain and rivers.

In 1880 Mr. Topley was called upon to abandon his field-work in Northumberland in order to superintend the publication of Maps and Memoirs at the Geological Survey Office in Jermyn Street. This post, which for many reasons was congenial to him, he continued to occupy; and on the retirement of Mr. Edward Best in 1893, Mr. Topley was entrusted with the entire charge of the office. Throughout this period in London the multifarious duties of the department gave but little opportunity for continuous scientific work: ever busy, he was seldom able to do more than the routine work of the office, but his wide knowledge and experience were always at the service of his colleagues and of others who frequently sought advice and information.

Eager at all times to promote the progress of Geology, Mr. Topley took a leading part in the work of that most useful compendium of geological literature, the *Geological Record*; and here his extensive acquaintance with bibliography was of great service. Finally, in 1887, he undertook the post of Editor, at a time when the *Record* was in a somewhat troubled condition, owing to delays in publication. These had arisen, despite every effort made by the untiring and disinterested exertions of the original Editor, Mr. Whitaker. In labour which is arduous, by no means uniformly interesting, which brings but little credit, and is wholly unremunerative, it is far from easy to gain and retain steady-working contributors. Men may come to aid the work; but too

often they go after dissipating a small amount of energy in recording titles and making short abstracts of papers. Two volumes, dealing with the literature of 1880-84, were brought out in 1888 and 1889; but, even with the effective help rendered by Mr. C. D. Sherborn, the Geological Record had ultimately to be abandoned.

Mr. Topley joined the British Association at the Meeting held in Brighton in 1872, and was at once made one of the Secretaries of Section C (Geology); and from 1872 to 1888 he served this office during no less than fifteen meetings. He was for several years Secretary of a committee appointed by the Association to report upon the Coast Erosion of England and Wales. He was also for some years a member of the Councils of the Geological Society and of the Geologists' Association. In 1885 he was elected President of the latter body, and during his term of office he prepared the interesting account of "The Life and Work of Professor John Morris," which he read in 1886 in place of an Anniversary Address. The long excursion of the Association for the same year was made to the Ardennes on the frontier between Belgium and France; and this, their second foreign excursion, was one of singular interest and success. It was organized with the aid of M. Dupont, but the arrangements and direction of the excursion fell largely upon the President, Mr. Topley. In the following year, aided by Professor Lebour, the President conducted the Association to many of the scenes of his former labours in Northumberland. On other occasions he led the Members to some of his old haunts in the Wealden area, and to several localities in and around London.

When the International Geological Congress arranged for a meeting in London in 1888, Mr. Topley (who had attended previous gatherings) was chosen as one of the Secretaries, and then, not only during the meeting, but for a long while before and afterwards, his energies were severely taxed with the many duties he had to perform. One feature of this London meeting was the promptitude with which the printed agenda and reports of proceedings were issued day by day—work that was only accomplished by dint of burning much midnight oil.

In 1885 Mr. Topley had prepared an elaborate Report on the National Geological Surveys of Europe; and he was much interested in the question of an international scheme of colouring for geological maps. He had, in 1881, been appointed to superintend the publication of the British section of the Geological Map of Europe, promised by the International Geological Congress; and in 1888 (conjointly with Mr. J. G. Goodchild) he prepared the excellent little Geological Map of Europe which accompanies the second volume of Prof. Prestwich's Geology.

Thus were his services in constant demand. At one time Agricultural Geology occupied a large share of his attention, and he had gathered together much material bearing on the subject, with the view of publishing a work on Soils in their relation to Geology. Several essays dealing with these matters were printed, and perhaps the most important outcome of his studies in the South-east of England was his paper dealing with the connection between the Parish Boundaries and the great physical features which are dependant on the geological structure. The subject was first brought before the Brighton meeting of the British Association in 1872, and it there attracted very considerable attention. The author showed how the ancient divisions of the land were made according to the water-supply, the soil, and situation; portions of down-land being taken to pasture sheep, the productive tracts for agriculture, and portions of forest-land, whether wood or open glade, for swine and as pasture for cattle.

In later years the subjects of Applied Geology occupied the greater part of Mr. Topley's leisure hours. He had given a good deal of attention to the mode of occurrence of Phosphates; he wrote a report on the geological distribution of Gold and Silver; discussed the schemes for the construction of a Channel Tunnel; and wrote concerning the discovery of Coal in Kent.

The subject of Water Supply, however, more than any other engaged his mind, and it was one on which he was recognised as a leading authority. The needs of Hastings, Tunbridge Wells, Croydon, Birmingham, as well as of London, and many other centres, large and small, were investigated and reported on by him; and during the sittings of the late Royal Commission on

Metropolitan Water Supply he gave most important evidence, besides officially doing much work for the Commission in the preparation of maps and sections for the Report.

Sanitary Science was another branch of the subject to which he had applied his knowledge. He assisted Sir George Buchanan, in 1867, in a Report on the Distribution of Phthisis as affected by dampness of Soil; and in 1890 he was appointed chairman of Section III. of the Sanitary Institute, at the Congress held at Brighton. He then delivered an address on Geology in its relation to Hygiene, as illustrated by the Geology of Sussex.

To the study of Petroleum in its geological aspects he had latterly devoted much time, and he had in view the preparation of a treatise on that subject.

His knowledge, however, was by no means restricted to matters of professional concern. In his early days in the Weald, as Professor Le Neve Foster informs the writer, Mr. Topley was fond of Botany, and the two friends collected many specimens for determination at their field-quarters. At that time, too, he was a great reader of the works of Carlyle. Poetry, again, and the Fine Arts were subjects in which at all times he was greatly interested, and with which he possessed more than an average acquaintance.

Since 1875 Mr. Topley had been Examiner in Geology to the Durham University at the Newcastle College of Science; he also succeeded the late Mr. Bristow as Examiner in Geology to the Science and Art Department.

He was elected a Fellow of the Geological Society in 1862; an Associate of the Institute of Civil Engineers in 1874; and a Fellow of the Royal Society in 1888.

Full of energy until within about three weeks of his death, he had attended the Zurich meeting of the International Geological Congress. There, as an acknowledgment of his services, and a testimony to his wide acquaintance with the subject, the chairmanship of the Committee on Bibliography was offered to him; but this he declined on the ground of insufficient acquaintance with spoken French. Leaving Switzerland he subsequently paid a short visit to Algiers, when serious illness overtook him. He

had barely time to reach his home at Croydon, ere he was prostrated, and he finally succumbed to an attack of gastritis on September 30th, 1894.

The record of his life is one of constant and unremitting labour. Yet he was ever cheery, and what was perhaps most noteworthy, however much he was occupied, he was always willing, and without any trace of impatience, to be interrupted.

It is sad to feel that he has left unaccomplished several tasks which he had planned, and which he was peculiarly well fitted to perform; but, nevertheless, he leaves behind him a substantial record of good work done. It is far sadder to think of the loss of a most kindly, amiable nature—of a true friend, whose readiness in helping others too often stood in the way of the fulfilment of his own desires.

H. B. WOODWARD.

LIST OF WORKS BY W. TOPLEY.

1865. 1. On the Superficial Deposits of the Valley of the Medway, with Remarks on the Denudation of the Weald. (By C. Le Neve Foster and W. Topley.) *Quart. Journ. Geol. Soc.* vol. xxi. pp. 443-474.

1866. 2. Notes on the Roman Remains found at Newhaven. *Anthropological Review* (*Journ. Anthropol. Soc.*), No. 15, pp. excii., exciii.

3. Notes on the Physical Geography of East Yorkshire. *GEOL. MAG.* Vol. III. pp. 435-439.

4. The Denudation of the Weald. (Letter by C. Le Neve Foster and W. Topley.) *Ibid.* pp. 571, 572.

1867. 5. The Origin of Escarpments. [Letter.] *GEOL. MAG.* Vol. IV. pp. 184-186.

1868. 6. On the Lower Cretaceous Beds of the Bas-Boulonnais, with Notes on their English Equivalents. *Quart. Journ. Geol. Soc.* vol. xxiv. pp. 472-483.

1871. 7. On the Comparative Agriculture of England and Wales. *Journ. Royal Agric. Soc.* ser. 2, vol. vii. pp. 268-284.

1871-4. 8. The Geology of the Neighbourhood,—in Pelton's *Illustrated Guide to Tunbridge Wells*. Chap. x. pp. 156-165, of ed. 5, and pp. 176-185, of ed. 6 (1874). 8vo. *Tunbridge Wells*.

1872. 9. Memoirs of the Geological Survey of England and Wales, vol. iv. The Geology of the London Basin Various Notes, chiefly pp. 341-343. 8vo. *London*.

10. The Geology of the Straits of Dover. *Quart. Journ. Science*, vol. ix. (ser. 2, vol. ii.), pp. 208-223. Three plates.

11. On the Agricultural Geology of the Weald. *Journ. Royal Agric. Soc.* ser. 2, vol. viii. pp. 241-267.

1873. 12. The Sub-Wealden Exploration. *Rep. Brit. Assoc.* for 1872, pp. 122, 123; in full in the *Brighton Daily News*, August 16th, 1872.

13. On the Relation of the Parish Boundaries in the South-East of England to great Physical Features, particularly to the Chalk Escarpment. *Journ. Anthropological Inst.* vol. iii. pp. 32-56. (Abstract in *Rep. Brit. Assoc.* for 1872, pp. 197, 198.)

14. Geological Model of the South-East of England and part of France, including the Weald and the Bas-Boulonnais. (By W. Topley and J. B. Jordan.) *London*.

1874. 15. On the Correspondence between some Areas of Apparent Upheaval and the Thickening of Subjacent Beds. *Quart. Journ. Geol. Soc.* vol. xxx. pp. 186-194. (Abstract in *Rep. Brit. Assoc.* for 1873, p. 91.)

16. On the Whin Sill of Northumberland. (By W. Topley and G. A. Lebour.) *Rep. Brit. Assoc.* for 1873, Sections, p. 92.

17. The Sub-Wealden Exploration. *Trans. N. of Engl. Inst. Engineers*, vol. xxxiii. pp. 185-188.

18. The Channel Tunnel. *Pop. Sci. Rev.* vol. xiii. pp. 394-403. Plate.

19. Notes on the Geology of Rothbury [Northumberland]. Chap. x. (pp. 49-56) of 'Guide to Rothbury and Upper Coquetdale.' *Alnwick.* 8vo. ed. 2. (The Geology reprinted from ed. 1, 1873.)

1874-6. 20. Geological Reports on the Sub-Wealden Exploration. *Rep. Brit. Assoc.* for 1873, pp. 491-495; for 1874, pp. 22-27; for 1875, pp. 347-349. (See also H. Willett, the Record of the Sub-Wealden Exploration. 8vo. *Brighton*, 1878.)

1875. 21. Memoirs of the Geological Survey, England and Wales. The Geology of the Weald (parts of the Counties of Kent, Surrey, Sussex, and Hants). 8vo. *London*.

22. Sand-Dunes and Blowing Sand. *Pop. Sci. Rev.* vol. xiv. pp. 133-142.

23. Sub-Wealden Exploration. *Nature*, vol. xi. pp. 284, 285.

24. The Channel Tunnel.—Submarine Explorations. *Nature*, vol. xiii. pp. 133, 134.

25. Report [to the Corporation] on the Water Supply of Hastings. Folio, pp. 18. *Hastings*.

1876. 26. On the Channel Tunnel. *Rep. Brit. Assoc.* for 1876. Sections, p. 253.

27. Table of the Cretaceous and Oolitic Rocks in the South-East of England (scale 1000 ft. to 1 in.), distinguishing those discovered in the Sub-Wealden Boring. Section from London to St. Leonard's, through Sub-Wealden and Kentish Town Borings (scale an inch to 8 miles). Appended to H. Willett's Report on the Sub-Wealden Exploration.

28. Water Supply and Public Health. *Pop. Sci. Rev.* vol. xv. pp. 31-45.

1877. 29. On the Intrusive Character of the Whin Sill of Northumberland. (By W. Topley and G. A. Lebour.) *Quart. Journ. Geol. Soc.* vol. xxxiii. pp. 406-422.

30. On the History and Results of the Sub-Wealden Exploration. Pp. 380-389 of vol. ii. of "Science Conferences. Conferences held in connexion with the Special Loan Collection of Scientific Apparatus, 1876." 8vo. *London*.

31. Sub-Wealden Boring. (By H. Willett and W. Topley.) Pp. 837-839 of Catalogue of the Special Loan Collection of Scientific Apparatus at the South Kensington Museum. Ed. 3. 8vo. *London*.

32. Notes on the Geology of Sussex. Pp. 16-23, Tourists' Handbook of Sussex, by G. F. Chambers. 8vo. *London*.

1878. 33. The History of the Sub-Wealden Boring. Pp. 151-160; and Geological Map of Sussex (scale 4 miles to an inch) and sections illustrating the Geology of the S.E. of England and the Sub-Wealden Boring, in F. Dixon's *Geology of Sussex*. Ed. 2. 4to. *Brighton*.

34. Report [to the Channel Tunnel Company] on the Recent French Explorations connected with the Channel Tunnel. 8vo. pp. 14. Plate. *London*. (Privately printed.)

1879. 35. The Valley of the Aln, its Geology and Scenery. *Alnwick Mercury*, November 17.

1880. 36. The Permanence of Oceans and Continents. [Letter.] *GEOL. MAG.* Dec. II. Vol. VII. pp. 573, 574.

1881. 37. The International Geological Congress, Bologna, 1881. *GEOLOGICAL MAGAZINE*, Dec. II. Vol. VIII. pp. 557-561; and *Nature*, vol. xxv. pp. 34, 35.

38. The Geological Survey of Italy. *Nature*, vol. xxv. pp. 86, 87.

39. Two Sections to Illustrate Excursion to the East End of the Isle of Wight. *Proc. Geol. Assoc.* vol. vii. p. 187.

1882. 40. Excursion to Battle and Hastings. *Proc. Geol. Assoc.* vol. vii. pp. 356-359; *Record of Excursions*, 1891, pp. 127-130.

41. On an International Scale of Colours for Geological Maps. *Rep. Brit. Assoc.* for 1881, pp. 647, 648.

42. On the Proceedings of the International Geological Congress at Bologna. [Maps.] *Quart. Journ. Geol. Soc.* vol. xxxviii. (Proc.) pp. 6-9.

1883. 43. On the Synclinal Structure of the Straits of Dover. *Rep. Brit. Assoc.* for 1882, p. 546.

44. Excursion to Hythe, the N.E. corner of Romney Marsh, Sandgate, and Folkestone. *Proc. Geol. Assoc.* vol. viii. pp. 92-96; *Record of Excursions*, 1891, pp. 67-69.

45. Excursion to Worth [Sussex]. *Proc. Geol. Assoc.* vol. viii. pp. 185, 186; *Records of Excursions*, 1891, pp. 114, 115.

46. Appendix to J. S. Diller's "Notes on the Geology of the Troad." *Quart. Journ. Geol. Soc.* vol. xxxix. pp. 633-636.

47. Report of the Committee . . . appointed to assist in the preparation of an International Geological Map of Europe. *Rep. Brit. Assoc.* for 1882, pp. 241, 242.

1884. 48. The Earthquake [Essex, April 22, 1884]. *Nature*, vol. xxx. pp. 17, 18, 60-62.

49. Excursion to the Crystal Palace. *Proc. Geol. Assoc.* vol. viii. pp. 391, 392.

50. Water Supply in its influence on the Distribution of the Population. *Journ. Soc. Arts*, vol. xxxii. No. 1654, pp. 857-859; and *Health Exhibition Literature*, vol. vii.

51. Report on the Battle Water Supply. Folio, pp. 3. *Battle*.

1885. 52. The National Geological Surveys of Europe. *Rep. Brit. Assoc.* for 1884, pp. 221-237. Reprinted, with an Appendix. 8vo. *London*. (See also *GEOL. MAG.* Dec. III. Vol. I. 1884, pp. 447-461.)

53. International Geological Congress. Reports of Sub-Committees on Classification and Nomenclature. Report of Sub-Committee, No. II. Cretaceous. Pp. 45-61. (By W. Topley and A. J. Jukes-Browne.) Ed. 2, 1888, pp. 63-78. 8vo. *Cambridge*.

54. Some Points of Comparison between Belgian and English Geology, pp. 43-51 of papers printed, with especial reference to the Excursion of the Geologists' Association to Belgium [not printed in the Proceedings of the Assoc.]. 8vo. *London*.

55. Excursion to Belgium and the French Ardennes—Brussels, Givet, Dinant, Namur, Grotto of Han, etc. Report by W. Topley and Mary Forster; with List of some works on the Geology of Southern Belgium, by W. Topley. *Proc. Geol. Assoc.* vol. ix. pp. 261-286.

56. Notes on the Physical Geography and Geology of Western Canada. *Report W. Kent Nat. Hist., etc., Soc.* for 1884-85.

1885-9. 57. Report of the Committee appointed for the purpose of inquiring into the Rate of Erosion of the Sea-coasts of England and Wales, and the Influence of the Artificial Abstraction of Shingle or other material in that Action. *Rep. Brit. Assoc.* for 1884, pp. 238-240, and *GEOL. MAG.* 1886, pp. 26-29 (with C. E. De Rance); *Rep. Brit. Assoc.* for 1885, pp. 404-442; *ibid.* for 1886, pp. 847-862; *ibid.* for 1888, pp. 898-933.

1886. 58. The Life and Work of Professor John Morris, M.A., F.G.S. *Proc. Geol. Assoc.* vol. ix. pp. 386-410.

59. Excursion of the Geologists' Association to Dungeness, Rye, and Hastings. *Proc. Geol. Assoc.* vol. ix. pp. 544-547.

60. Corporation of Croydon. Report upon the Water Works at Addington. (By W. Whitaker and W. Topley.) [*Corporation Records.*] Vol. v. No. 3, pp. 31-39; No. 12 (Plate). 8vo. *Croydon*.

1887. 61. Excursion to Brighton and Newhaven. *Proc. Geol. Assoc.* vol. x. pp. 141-144.

62. Notes on the recent Earthquake in the United States, including a telegraphic dispatch from Major Powell, Director of the United States Geological Survey. *Rep. Brit. Assoc.* for 1886, pp. 656, 657.

1888. 63. Gold and Silver: their Geological Distribution and their Probable Future Production. *Rep. Brit. Assoc.* for 1887, pp. 510-535.

64. Geological Map of Europe. (By W. Topley and J. G. Goodchild.) In Prestwich's *Geology*, vol. ii.

1890. 65. The Work of the Geological Survey in Northumberland and Durham. *Rep. Brit. Assoc.* for 1889, pp. 597-600.

1891. 66. Excursion to Leith Hill. *Proc. Geol. Assoc.* vol. xi. pp. clxiii.-clxvii.

67. [International Geological Congress. London, 1888.] *Compte-rendu*

des Excursions, pp. 238-240; Explication des Excursions—Introduction, pp. 241-244; Description des Routes vers Londres—De Newhaven à Londres, De Boulogne à Londres, De Calais à Londres. Pp. 248-264. Also various Bibliographies. Congrès Géologique International. 8vo. *London*.

1891. 68. Geology in its Relation to Hygiene. Address to Section III. of the Institute at Brighton, 1890. *Trans. Sanitary Institute*, vol. xi. pp. 215-225.

69. The Geology of Petroleum and Natural Gas. *GEOL. MAG.* Dec. III. Vol. VIII. pp. 508-511. *Rep. Brit. Assoc.* for 1891, pp. 637-639.

70. The Sources of Petroleum and Natural Gas. *Journ. Soc. of Arts*, vol. xxxix. No. 2,004, pp. 421-437.

1892. 71. Coal in Kent. *Trans. Federated Inst. Mining Engineers*, vol. i. pp. 376-387.

1893. 72. The Sandgate Landslip. *Geographical Journ.* vol. i. pp. 339-341.

73. The Landslip at Sandgate. *Proc. Geol. Assoc.* vol. xiii. pp. 40-47.

74. Excursion to Amwell and Chadwell Springs. *Proc. Geol. Assoc.* vol. xiii. pp. 123-125.

75. Minutes of Evidence taken before the Royal Commission on Metropolitan Water Supply. Pp. 37-39, 94, 95, 313-324, 447-453. Fol. *London*.

76. Memorandum on the Water-bearing qualities of the Rocks within, or adjacent to, the Basin of the Thames and Lea, pp. 411-413; Report on Reservoir Sites in the Upper Thames Valley, pp. 413, 414; Statement on the Chalk Area of East Kent, pp. 415-418. Appendices to Minutes of Evidence taken before the Royal Commission on Metropolitan Water Supply. Fol. *London*.

77. Geological sections through the London Basin and through N.E. Kent.

No. 1. Section from the North Downs near Caterham, through London to the Chiltern Hills.

2. Section from the North Downs near Westerham, across the River Thames to Purfleet.

3. Section through North-East Kent, from the North Downs near Stouting, to Wingham.

To accompany Report of Royal Commission on Metropolitan Water Supply. Fol. *London*.

78. [Geological Report.] Pp. 17-19 of "Borough of Tunbridge Wells Water Supply. Report of Mr. James Mansergh."

1894. 79. On the Relations of Geology to Physical Geography. *Rep. Brit. Assoc.* for 1893, pp. 834, 835.

80. Borough of Tunbridge Wells. Report on Water Supply. 8vo. pp. 4. *Tunbridge Wells*. (Privately printed.)

81. Excursion to Oxted and Titsey [Surrey]. *Proc. Geol. Assoc.* vol. xiii. pp. 291, 292.

82. The International Geological Congress [Zurich]. *Nature*, vol. 1. pp. 319, 320.

GEOLOGICAL SURVEY MAPS AND SECTIONS.

Maps on the one-inch scale:—Sheets 5 Ashdown Forest, Battle, etc., *part*, 1864 ; 6 Maidstone, etc., Drift, *part*, 1886 ; 46 N.E. Hitchin, etc., Drift, *part*, 1884 ; 105 N.W. Morpeth, *part*, 1871 ; 109 S.E. Coquet Island, etc., 1870 (Drift, 1882) ; 109 S.W. Rothbury, 1881 (Drift, 1893) ; 109 N.W. Alnwick (nearly ready).

Maps on the six-inch scale:—Northumberland: Sheets 44 Rothbury, 1878 ; 45 Brinkburn, 1879 ; 46 Felton, 1878 ; 47 Hauxley, 1871 ; 53 Fallowlees, 1880 ; 54 Longhorsley, 1878 ; 55 Ulgham, 1878 ; 56 Cresswell, 1870 ; 63 Hartburn, 1875 ; 64 Morpeth, 1879 ; 72 Bedlington, 1871 ; 80 Cramlington, 1871 ; 87 Heddon-on-the-Wall, *part*, 1873 ; 88 Gosforth, *part*, 1871.

Vertical Sections:—Sections of the Northumberland Coal-field: Sheets 54 (1874), 55 (1875), 64 (1878).

Horizontal Sections:—Sections across the Wealden area, etc.: Sheets 73 *part* (1868), 75 *part* (1867), 76 *part* (1867), 77 *part* (1867), 78 *part* (1867).

